Game theory - lab 1

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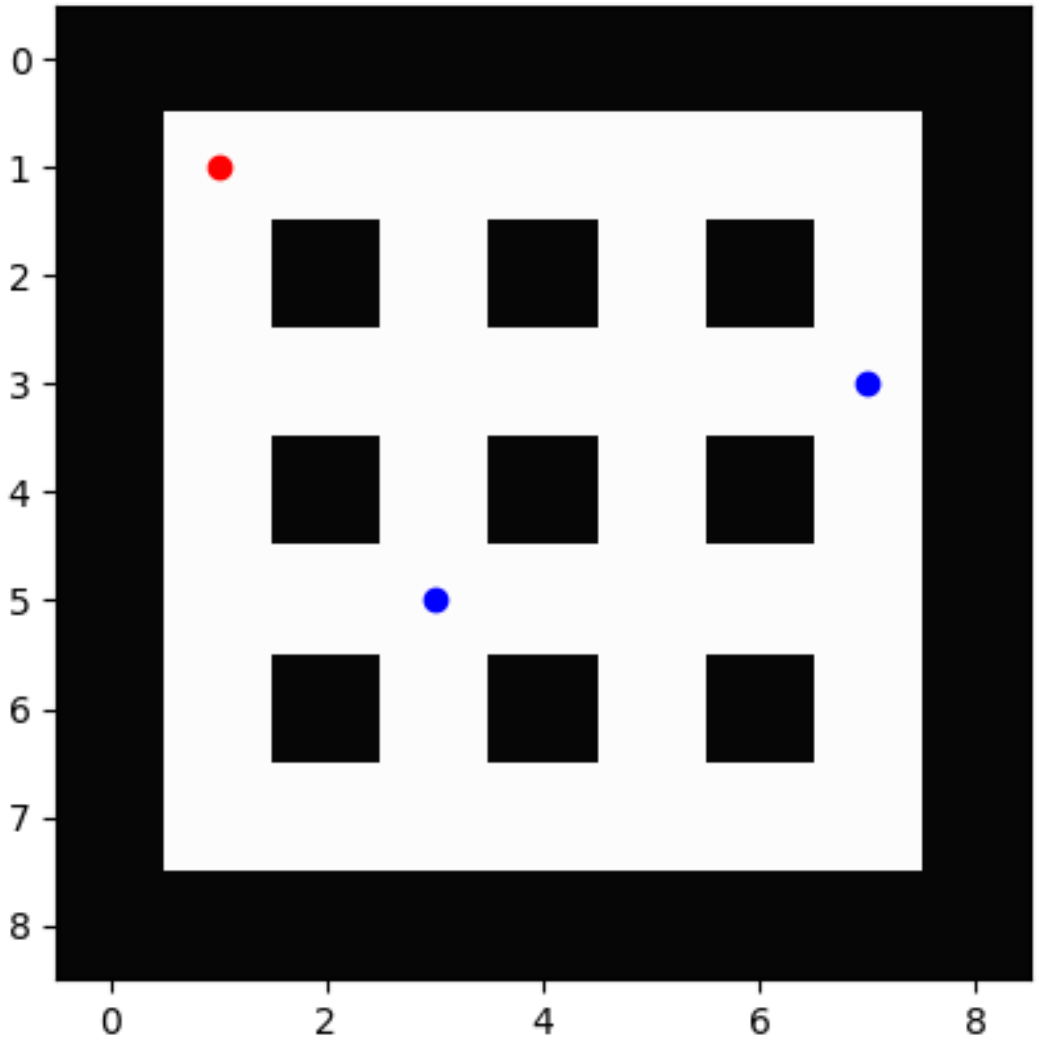
Overview

Game Theory

- Framework studying strategies of players when the outcome of the actions depend on the actions of the other players
- In the assignments we will focus on non-cooperative two-player zero-sum games, which are games where one player loses always the same amount as the second player gains.
- Optimal strategy is described by Nash equilibrium.

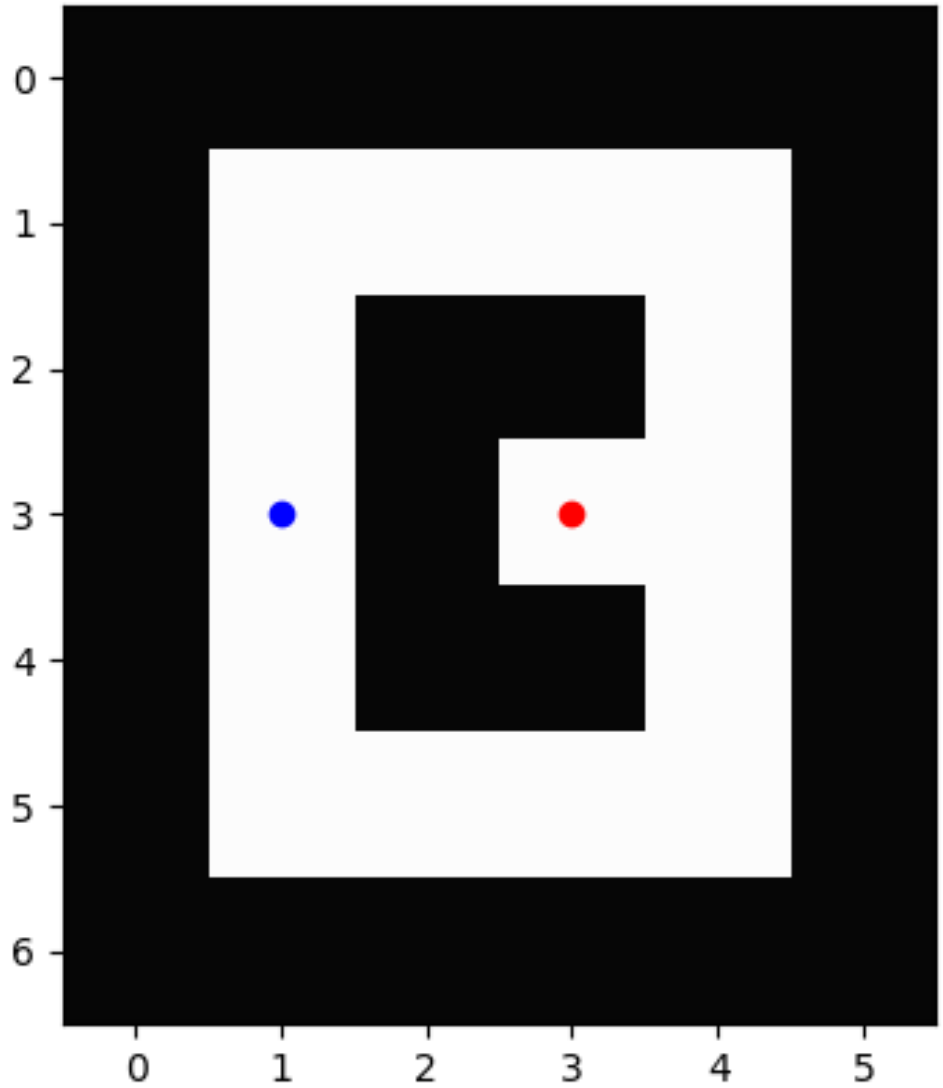
Pursuit Evasion Game

- Grid environment
- Simultaneous discrete moves
- Perfect information
- Evader (red) gets payoff for escaping for fixed amount of steps
- Pursuers (blue) get payoff for catching evader



Heuristic approaches

- Doing a move in such a way that I end in space closest/furthest to/from the opponent
- Euclidean distance does not work for pursuer even against stationary opponent
- Closest path is better but does not work with more pursuers in circular environment



Greedy Policy

- First task: t4a-greedy
- Implement player that will use greedy strategy - as pursuer will move towards closest evader, as evader will go to a place that is as far as possible from closest pursuer
- https://cw.fel.cvut.cz/wiki/courses/b4m36uir/hw/t4a-greedy

Patrolling

Patrolling polygonal environment

- Polygon with some fence and we have n robots to guard it
- Robots go around the fence and attacker picks a spot on the fence and attacks, going through the fence takes him some time t
- Optimal strategy is to have robots uniformly, facing all the same direction and some probability of turning (Multi-Robot Adversarial Patrolling: Facing a Full-Knowledge Opponent, Noa, 2014)
- https://cw.fel.cvut.cz/wiki/courses/b4m36uir/hw/t4d-patrol

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