Exercise 4

General Game Playing

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International Masters Programme in Computational Logic — winter term 2009/10

30.11.2009

Exercise 4.1

Implement the following game independent heuristics:

- **Mobility:** A state is the better the more options your player has and the less options your opponents have. The rational is, that you are controlling the game if your opponents do not have a choice. When implementing this make sure that the heuristic value does not oscillate wildly in alternating moves games, e.g., by averaging the value over some steps.
- **Novelty:** A state is the better the more it differs from its parent/ancestors or its other siblings. Especially in puzzles the goal state typically differs a lot from the initial state. Also, this heuristics is good for exploring different parts of the state space.
- **Inverse Mobilty:** A state is the better the less options your player has and the more options your opponents have. The rational is, that it is easier to decide if you do not have too many options (it decreases the size of the game tree).
- Goal Distance (optional): A state is the better the more literals of the goal condition are fullfilled.

For each of the heuristics find a game where your player plays better (i.e., solves the game faster or wins more ofter) with the heuristics than without. And conversely try to find a game where the heuristics does not help or even hurts. Try to explain the behavior.

Games you might want to try: all games from tutorial 2 and 3, asteroidsserial, breakthrough, breakthroughsuicide, bidding-tictactoe, catcha_mouse, cubicup, firefighter, minichess, pawn_whopping, peg_bugfixed, snake_2009.

All the games are available on `http://ggpserver.general-game-playing.de/`.

Exercise 4.2

Use a combination of the above heuristics and/or some additional ones in your player such that it works as good as possible in many games.