Introducion to Artificial Intelligence
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Miniproject 1: Kuromasu

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Kuromasu − Solving algorithm depth first search and A*

Rules of the puzzle

The board of a Kuromasu game is a rectangular grid, which consists of single cells. Some of the cells contain numbers. During the game the cells can be coloured with black or white. The fields, which contain numbers, are always white.

The goal of the game is to insert black fields so that the number of reachable white fields from the fields containing numbers equals the number written into the field. The number field itself is also counted. A white field can be reached if it is possible to go straight from the number field to the reachable field in a vertical or horizontal line. So they are in the same row or column as the number field without any interruption in between. It is not possible to skip black fields, so a black field interrupts the straight way.

Additionally all white fields must be connected, so that it is possible to go from each white field to each other white field by using only vertical or horizontal steps, not diagonal. Black fields may not be connected vertically or horizontally, so they do not share a common side. They may be connected diagonally. Nevertheless as a conclusion of the previous rules it results that it cannot be possible to go in a circle or from the edge to the board again to the edge by doing only diagonal steps using black fields. If that was the case, then one part of the white fields would be separated from the rest.

Puzzle space/search space

The puzzle space contains all the descriptions of possible combinations of colouration of the board. It also contains the combinations which don't fulfil the constraints of the rules of the game. One description of the board can be for example an array or a list with entries for each cell, specifying its colour. Possible entries are white, black, not decided or the number written into the cell. The search space contains only the feasible solutions. That means all the colourations of the board which match the specification of the rules. For example solutions with adjacent black fields are not taken into account.

Heuristic function

Possible function: choose the option where most white fields are solved at once. Goal is to solve game with as least black fields as possible. So when the more white fields one black field solves the better.