

## Assignment 2: Solving Akari using CSP

Due Tuesday, 12 November, 11:00pm

**Akari** uses a rectangular grid of black cells and white cells.<sup>1</sup> The player solves puzzles via placing light bulbs in the white boxes according to following rules:

- Light bulbs are permitted to be placed at any white square. A numbered square indicates how many light bulbs are next to it, vertically and horizontally.
- Each light bulb illuminates from itself to a black square or the outer frame in its row and column.
- Every white square must be illuminated and no light bulbs should illuminate each other.

For instance, an instance of this puzzle, and its solution are presented in Figure 1.

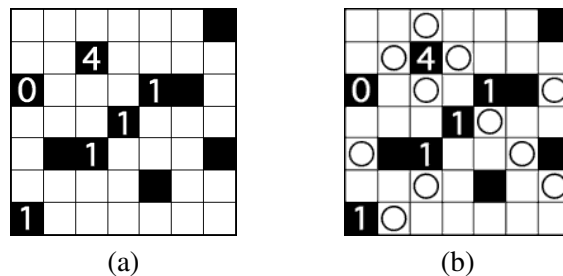


Figure 1: (a) A sample initial board in Akari, and (b) its solution.

Represent Akari as a Constraint Satisfaction Problem (CSP). Find 3 different Akari puzzles of different difficulties. Use an existing CSP solver, such as

- Google OR-Tools CP Solver: <https://developers.google.com/optimization/>
- python-constraint: <http://labix.org/python-constraint/>
- Gecode: <http://www.gecode.org/>

to solve these puzzles based on the CSP representation. Make sure that your solution is readable by human; for instance, you can use a matrix to represent the board.

<sup>1</sup><http://www.nikoli.co.jp/en/puzzles/akari.html>

**Submit** the following files at SU Course:

- A pdf file containing your CSP representation of Akari, and a discussion on whether A\* or CSP is more appropriate for solving Akari.
- The source files containing the representation of Akari and the puzzles presented to the CSP solver, and the solutions of the puzzles computed by the CSP solver.

**Demos** Make a demo of your solution at one of the following times:

- Tuesday, 13 November, 16:40–17:30
- Wednesday, 14 November, 13:15–14:15
- Friday, 16 November, 11:30–12:30

The places will be announced at SUCourse.

**Late policy** Late assignments will be handled based on a system of “grace days”: you begin the term with two grace days, an assignment handed in from one minute to 24 hours late uses up one grace day, and 24:01 to 48 hours late uses up two grace days.