Akari goes tablet

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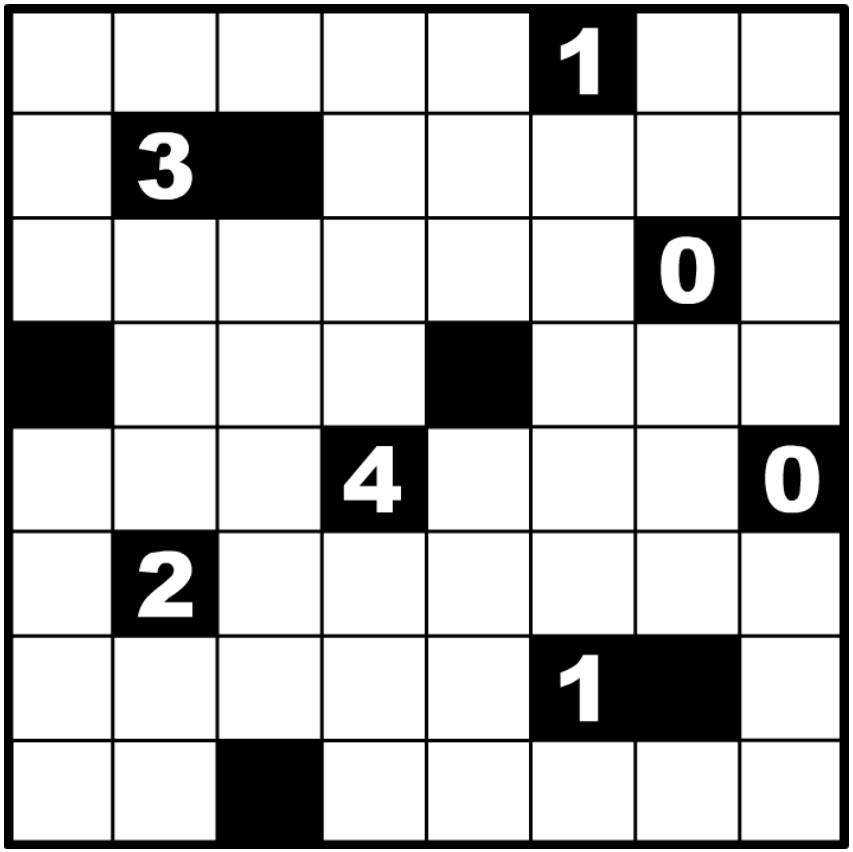
Content

What is Akari?

- Japanese pencil puzzle game
- Also called “Light Up”
- Published in 2001 by Nikoli, a publisher for games and logic puzzles

Game-field

- Rectangular grid of white and black cells
- Goal: Light bulbs must be placed to light all white cells



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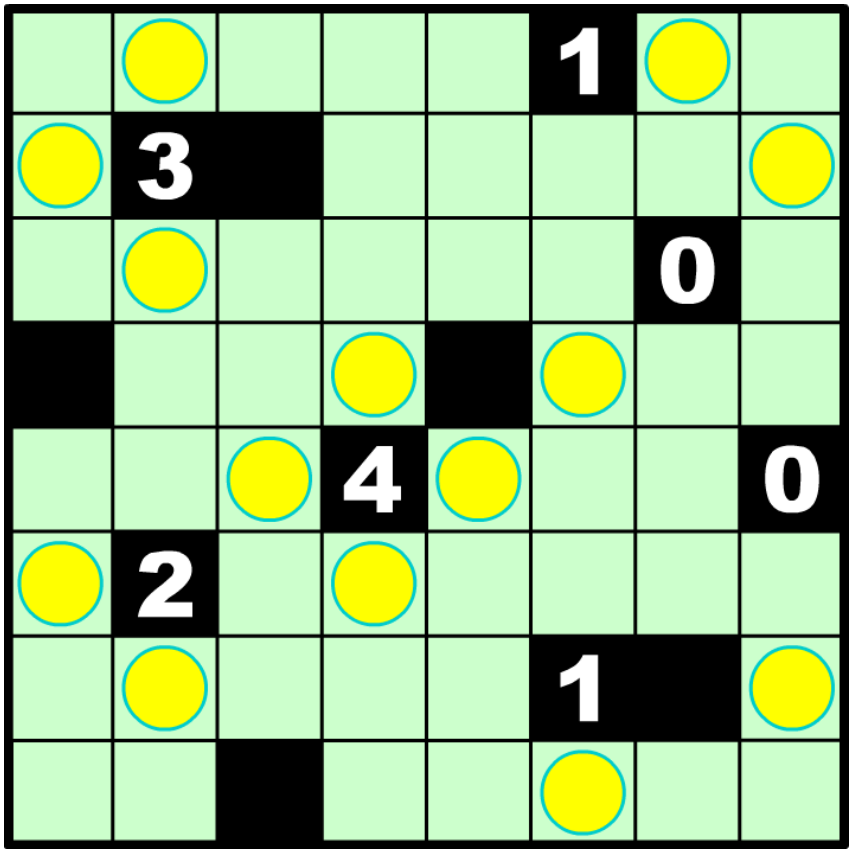
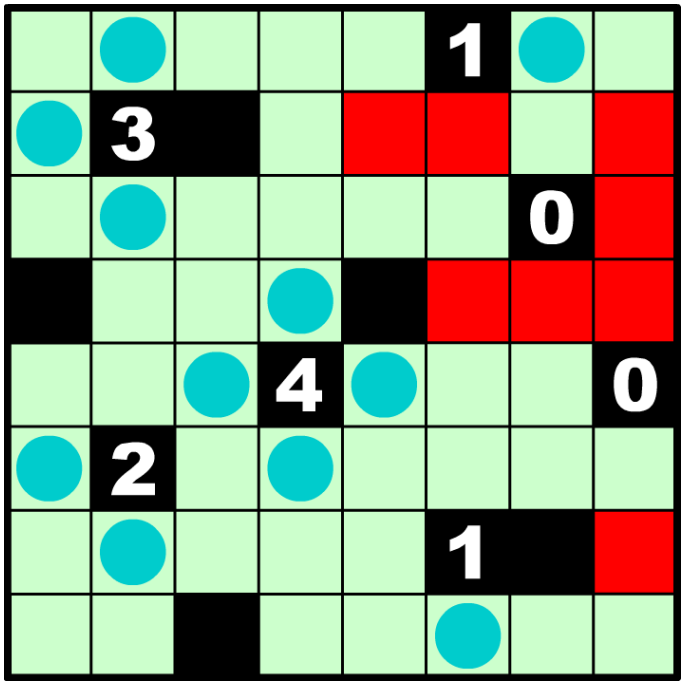


Light bulbs

- Can be placed within the white cells
- A bulb sends rays of light horizontally and vertically, illuminating its entire row and column unless its light is blocked by a black cell
- Bulbs may not shine on each other



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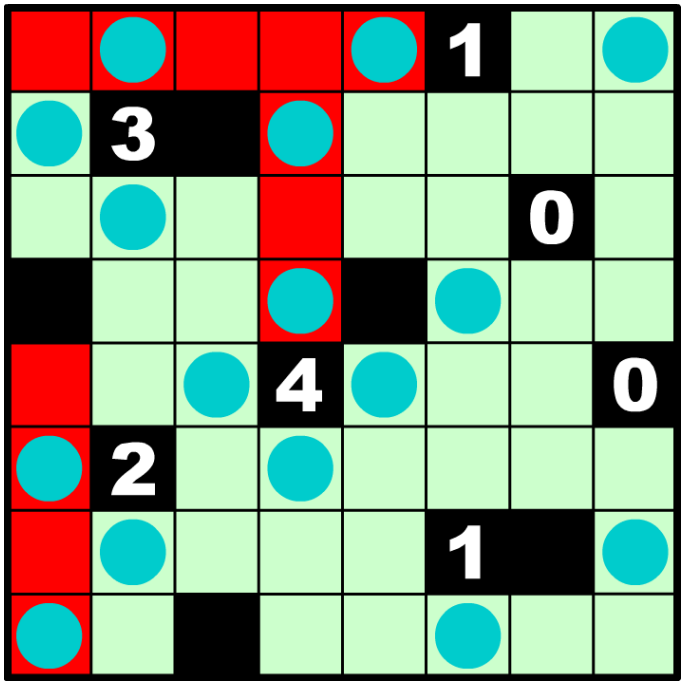
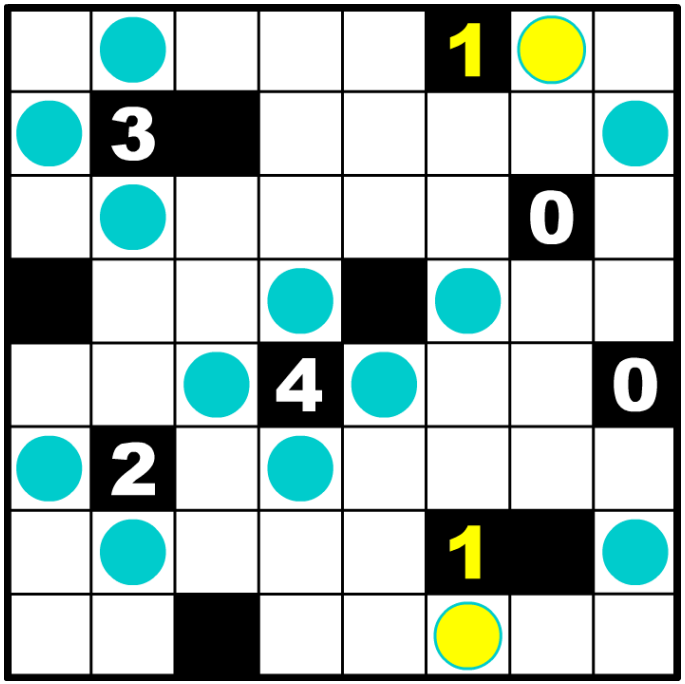


Black cells

- May have a number from 0 to 4 on it
- The number indicates the exact amount of bulbs that must be placed next to the cell (horizontally and vertically)
- Unnumbered black cells may have an arbitrary number of adjacent light bulbs



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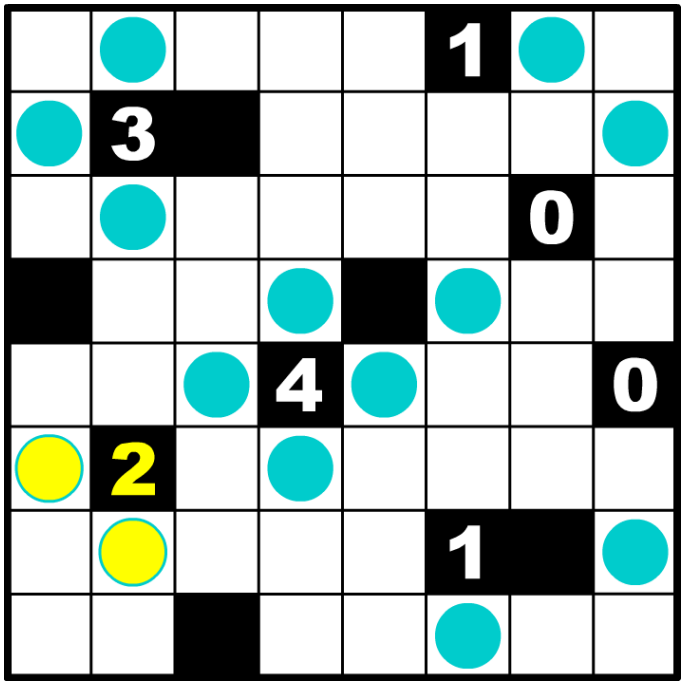

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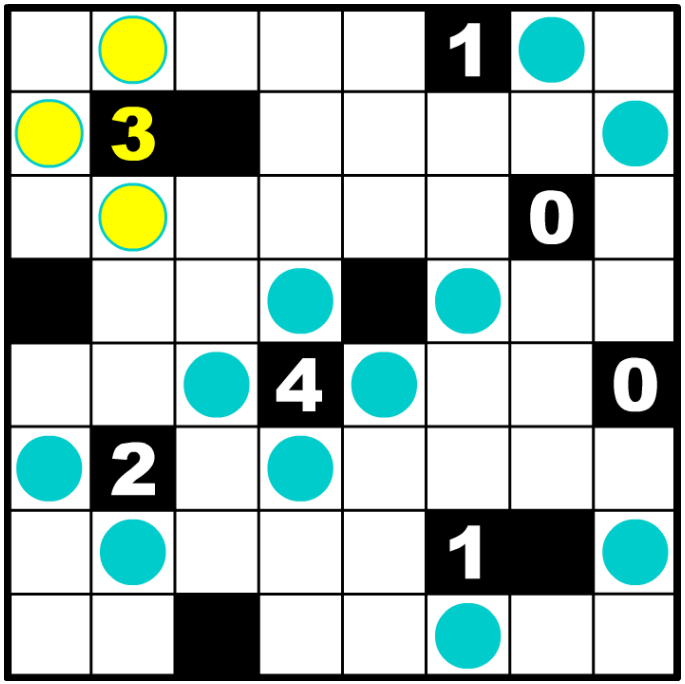

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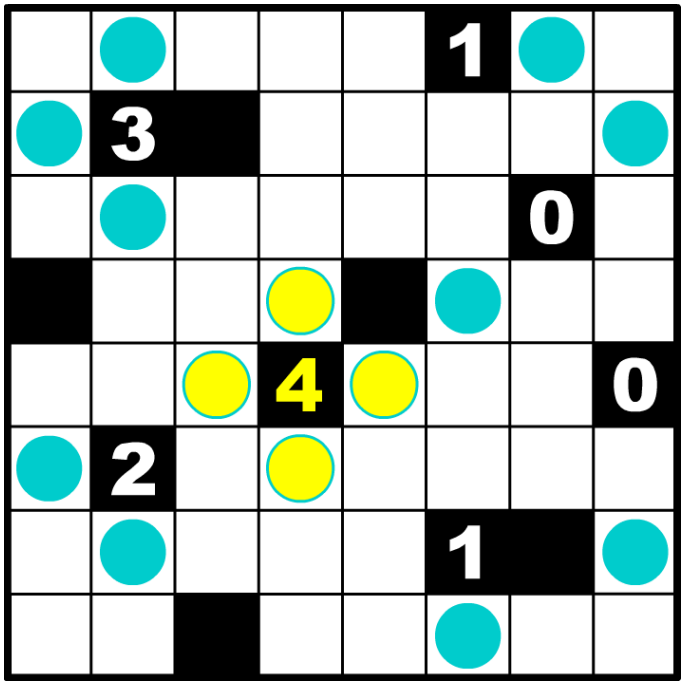

Aim of the project

- Implement a user-interface for Android tablets
  - User-friendly
  - Support as many Android versions as possible
- Implement a solver and generator for Akari puzzles
  - Use encodings in satisfiability formulas
  - Generate uniquely solvable puzzles of various difficulty

Possible engines

- Cocos2D-x
  - Platforms: iOS, Android, WindowsPhone8, BlackBerry
  - Language: C++
  - License: MIT
- AndEngine
  - Platforms: Android
  - Language: Java
  - License: LGPL
- LibGDX
  - Platforms: Android, iOS
  - Language: Java
  - License: Apache v2

Solver

- Akari was proved to be NP-hard
- SAT solver could provide a more efficient solution then traditional approaches
- Possible solver:
  - Sat4j
  - Native compiled SAT solver
  - SMT

Generator

- For many puzzles the task to find an other solution for a already computed solution is also NP-hard
- Creating random levels with a SAT solver could be tricky
- Finding unique solutions could be difficult
  - Might be hard to express in SAT
  - Converting a puzzle with multiple solutions into a puzzle with one solution could be impossible
  - Solving of puzzles is a sub task of the generator $\rightarrow$ Testing many levels for unique satisfiability could be inefficient

Optional features

- Level-Chooser that is able to synchronize with a server
- Give hints to the player
- Compare high-score with other players
- Provide multiple game-modes (standard-mode, time-mode, expert-mode, ...)
- Share random generated levels