FUTOSHIKI SOLVER
using Clingo and Java

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Summary

What are ASP and Clingo

What is Futoshiki

How to use my application

How it works

Why is it better

What I have learned

What are ASP an Clingo

Answer set programming

- Declarative programming
- For difficult search problems (NP-hard)
- AnsProlog

Clingo

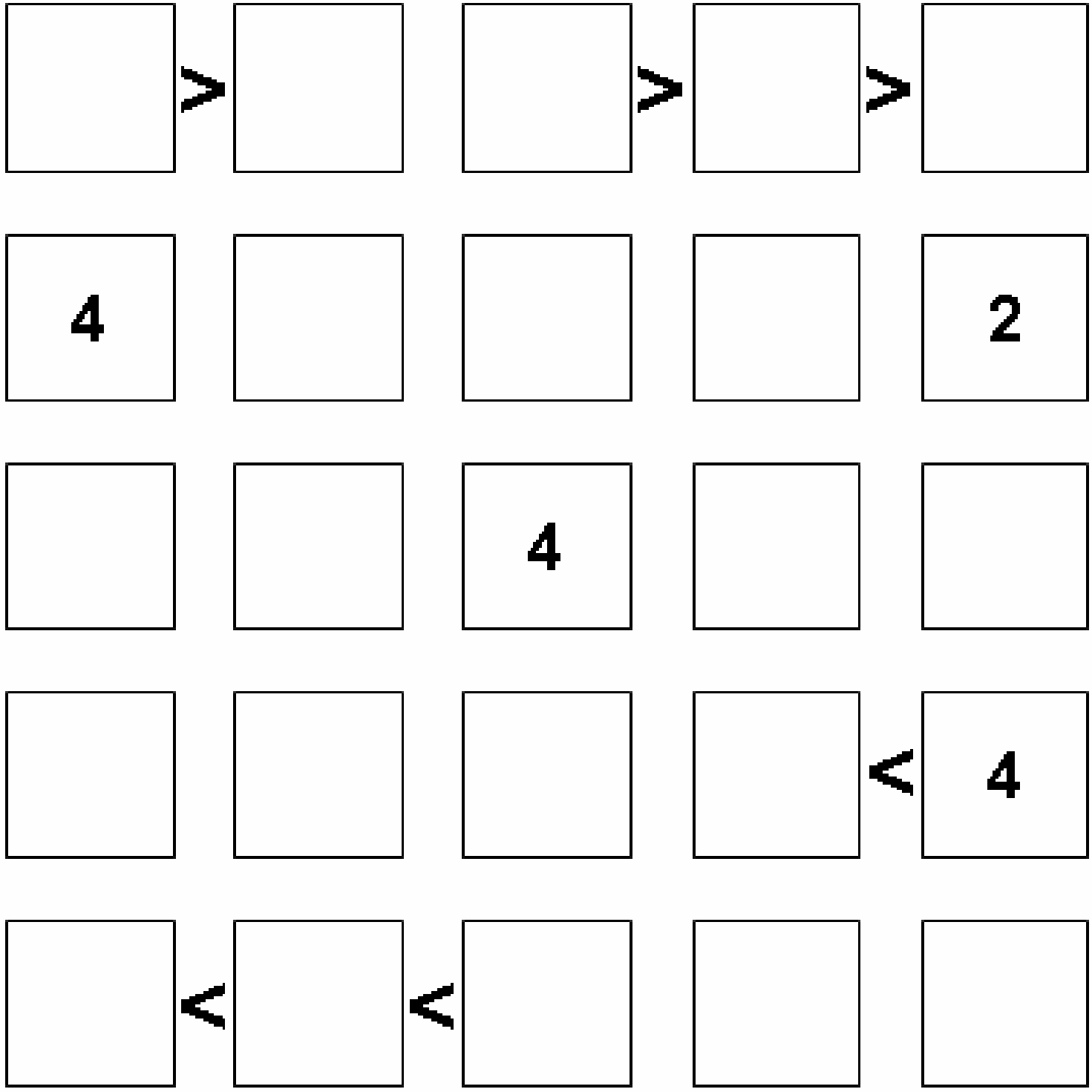
- Potassco - University of Potsdam
- Gringo + Clasp

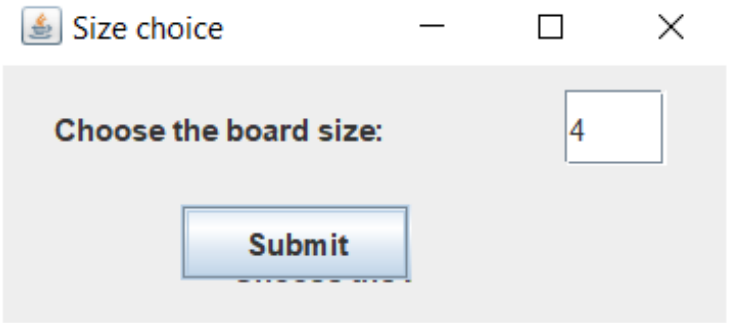
What is Futoshiki

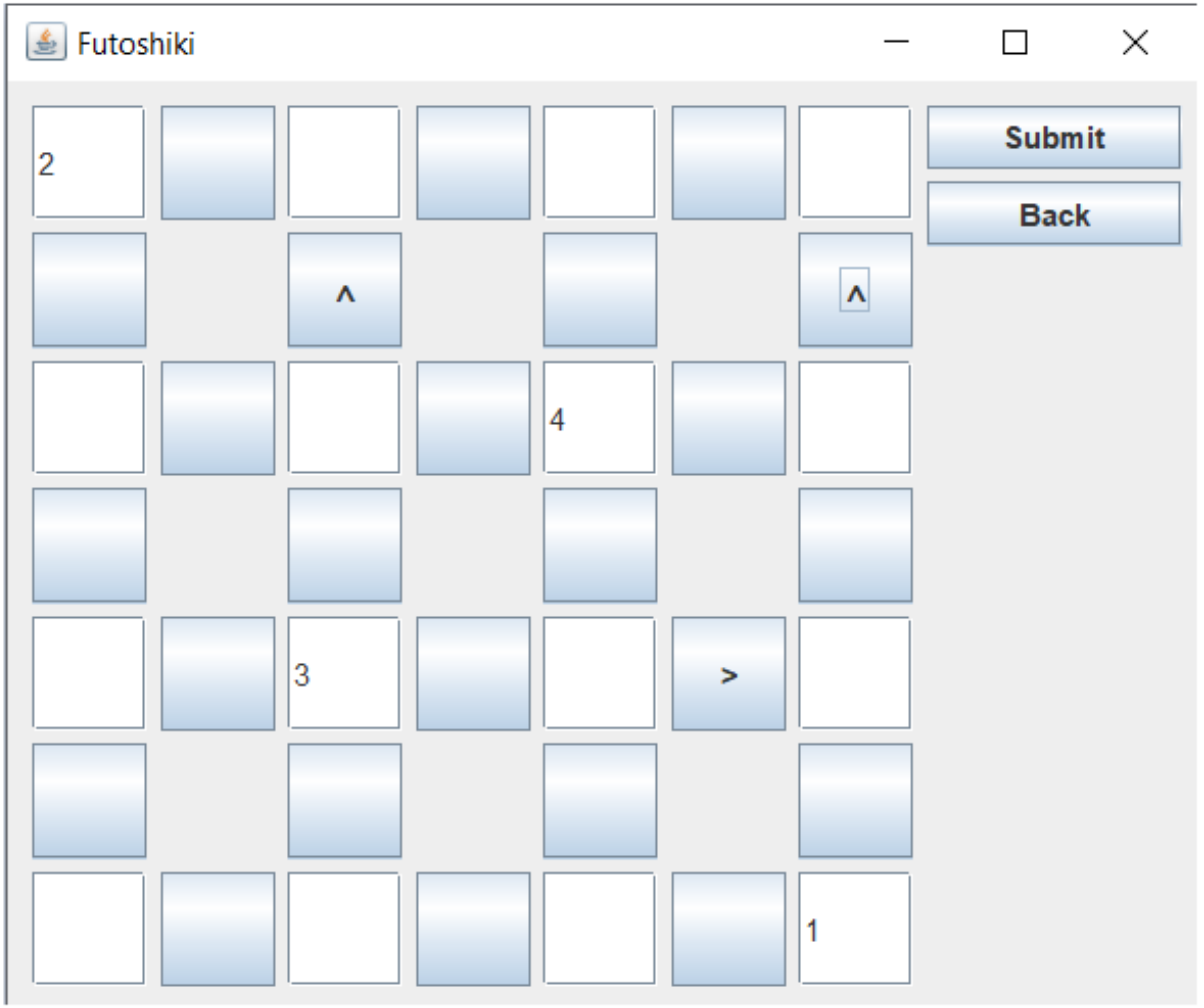
Japanese puzzle

Similar to Sudoku

Tamaki Seto, 2001


4
2
4
4


Size choice
Choose the board size:
4
Submit


Futoshiki
Submit
Back
2
^
^
4
3
>
1

C: > Users > calin > Desktop > Futoshiki > futoshiki.lp

```
% Define the possible range of values
number(1..size).

% Fill the given values
x(X,Y,N) :- given(X,Y,N).

% Check for rows and columns to have unique values
1 { x(X,Y,N):number(N) } 1 :- number(X), number(Y).
1 { x(X,Y,N):number(X) } 1 :- number(N), number(Y).
1 { x(X,Y,N):number(Y) } 1 :- number(N), number(X).

% Check for "less than" constraints
:- x(X1,Y1,N1), x(X2,Y2,N2), lessThan(X1,Y1, X2,Y2), N1 >= N2.

#show x/3.
```

c: > Users > calin > Desktop > Futoshiki > input.lp

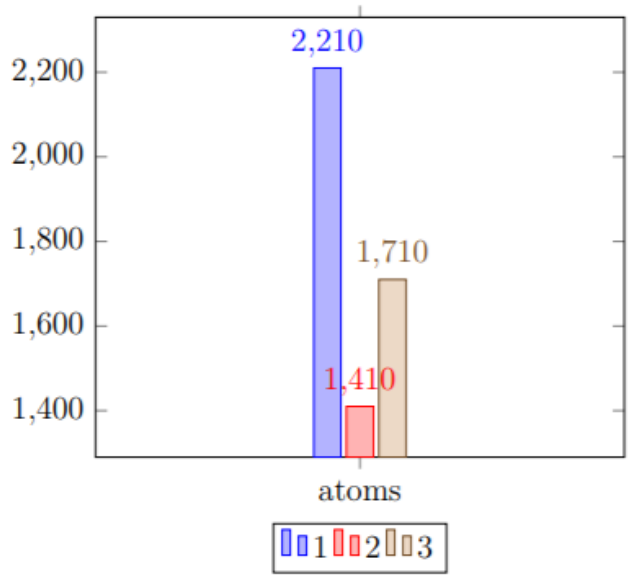
```
#const size = 5.

given(1,2,1).

lessThan(1,2, 2,2).
```

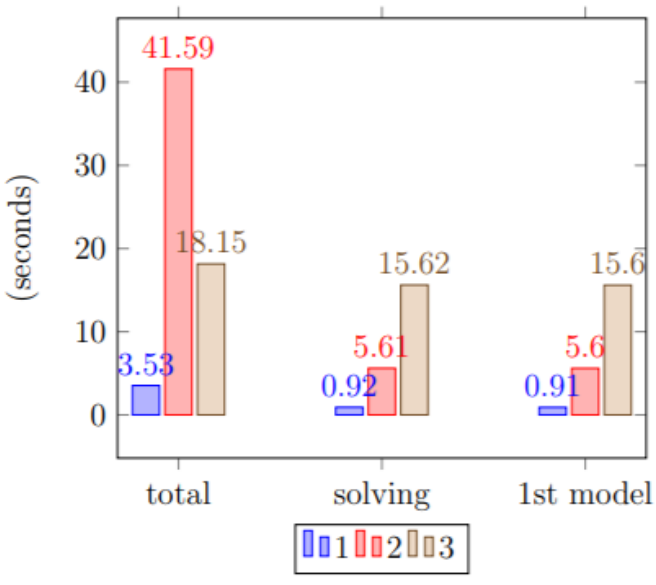
1. The one being used:

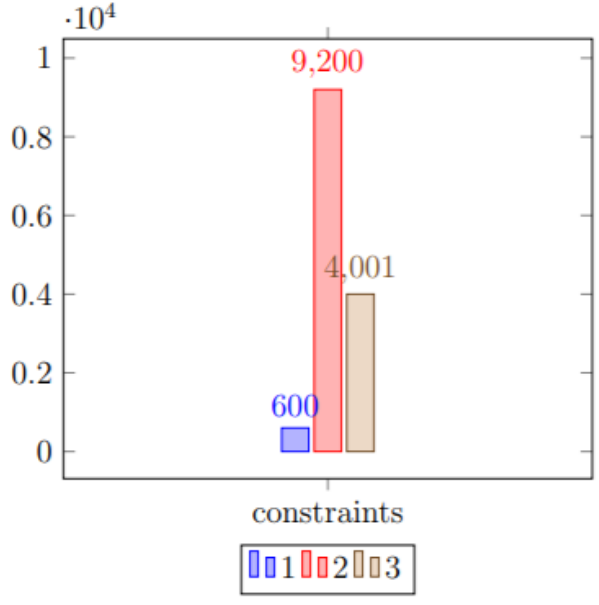
```
1 { x(X,Y,N):number(N) } 1 :- number(X), number(Y).
1 { x(X,Y,N):number(X) } 1 :- number(N), number(Y).
1 { x(X,Y,N):number(Y) } 1 :- number(N), number(X).
```

2.
```
1 { x(X,Y,N):number(N) } 1 :- number(X), number(Y).
:- x(X,Y1,N), x(X,Y2,N), Y1!=Y2.
:- x(X1,Y,N), x(X2,Y,N), X1!=X2.
```

3.
```
1 { x(X,Y,N):number(N) } 1 :- number(X), number(Y).
:- 2 { x(X,Y,N) : number(N) }, number(X), number(Y).
:- 2 { x(X,Y,N) : number(X) }, number(N), number(Y).
:- 2 { x(X,Y,N) : number(Y) }, number(N), number(X).
```







What have I learned?

Answer Set Programming

Clingo

LaTeX

Futoshiki

Thank you!