KENKEN Puzzle

Course Code: **CSE481**

Course Name: **Artificial Intelligence**

Ain Shams University
Faculty of Engineering
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GitHub Repo Link

https://github.com/AmrAhmed11/kenken-puzzle-solver

Performance Analysis

Total Backtracking Search: 4.9437 Seconds

Total Backtracking Search with Arc Consistency: 0.3650 Seconds

Total Backtracking Search with Forward Checking: 0.0533 Seconds

Average Backtracking Search Per Test: 0.0494 Seconds

Average Backtracking Search with Arc Consistency Per Test: 0.0036 Seconds

Average Backtracking Search with Forward Checking Per Test: 0.0005 Seconds

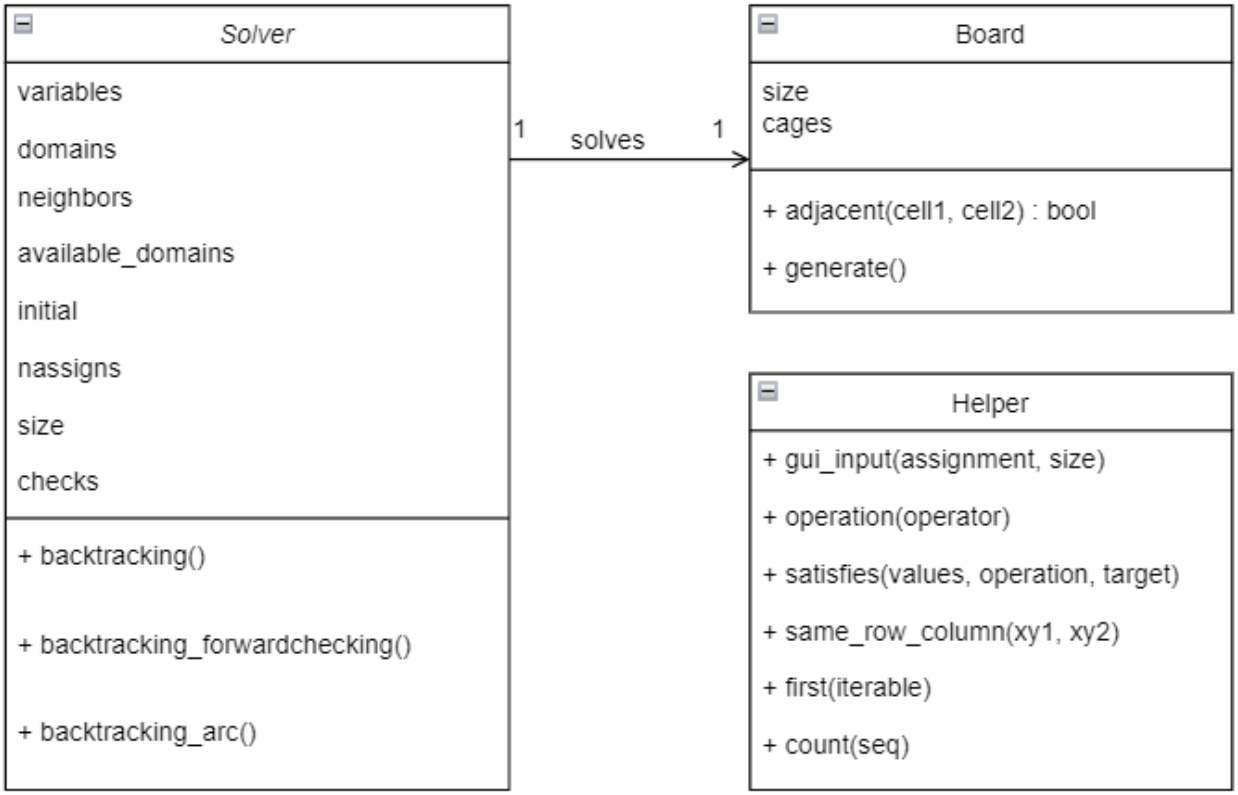
Average Grid Size: 4

Re-run Tests Run Game

We run the three algorithms on 100 randomly generated boards with random sizes from 2 to 6.
The speed ranks:

1- Backtracking search with forward checking.
2- Backtracking search with arc consistency.
3- Backtracking search.

Class diagram



Data structures

Board is represented as a list of tuples. Each tuple represents a cage. The cage tuple has 3 fields

The first one is a tuple of tuples. Each one represents the coordinates of a cell that belongs to the cage.

The second field is a character that represents the operation used in the cage (+, -, *, /, .)

The third field is an integer that represents the target result of the cage.

```
[(((1, 1),), '.', 2), (((2, 1), (3, 1)), '/', 3), (((1, 2), (1, 3)), '-', -2), (((2, 2), (2, 3), (3, 3), (3, 2)), '+', 8)]
```

An **Assignment** is represented as a dictionary, there is a key for each cage on the board.

The key is a tuple of tuples, where each of them is a coordinate of a cell in the cage.

The value is a tuple of the values of each cell in the cage.

```
{((1, 1),): (2,), ((2, 1), (3, 1)): (1, 3), ((1, 2), (1, 3)): (1, 3), ((2, 2), (2, 3), (3, 3), (3, 2)): (3, 2, 1, 2)}
```