

Sudoku solver by graph coloring

Sudoku board can be matched as undirected graph. Number of vertex equal to number place. Edges represents place on which there can't be the same number.

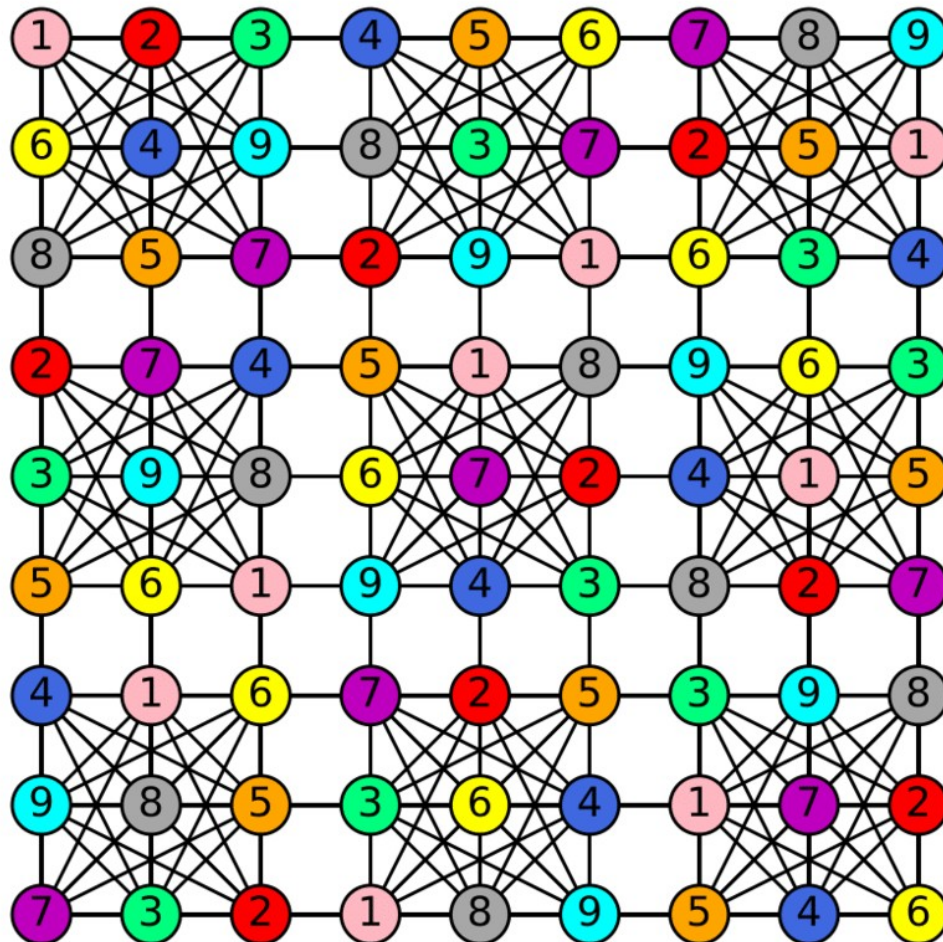


Fig 1: Shows graph related [1]

App using algorithm to graph coloring with backtracking for n colors. For correct solve must used n color equal to the numbers that can be entered in Sudoku.

Function `generate_graph9()`, `generate_graph6()`, `generate_graph4()` generating graph structure matched to Sudoku board for sizes: 9x9, 6x6, 4x4.

Function `check_sudoku()` is checking numbers on Sudoku board. Check incorrectly given digits.

Function `is_safe()` checking whether color can be use to coloring.

Function `graph_color(k, k_colors)` coloring graph with k numbers color. Recursive function with backtracking.[2]

App creates a list of nodes to color from put all colored vertex at the beginning of the list. Graph coloring function starts from first uncolored vertex.

App reads the txt file with the Sudoku(shown below). Where 0 is an empty space to be completed by the solver.

```
000000309
038000000
005000200
000400000
000062080
400500000
700000006
060030457
900200003
```

Example files(file9.txt, file6.txt, file4.txt) in directory of project.

Reference:

- [1] https://www.researchgate.net/figure/b-Graph-coloring-of-Sudoku_fig9_311668725
- [2] <http://users.uj.edu.pl/~ufkapano/algorytmy/lekcja14/color.html>