Eskişehir Technical University

BIM309 – Artificial Intelligence

3rd Assignment Submission Report

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Problem Statement

The problem is coloring a map with 4 colors, such that adjacent regions will not share the same color.

Algorithm

Backtracking search algorithm is used to find a solution to *map coloring problem*. This algorithm does not use any heuristic.

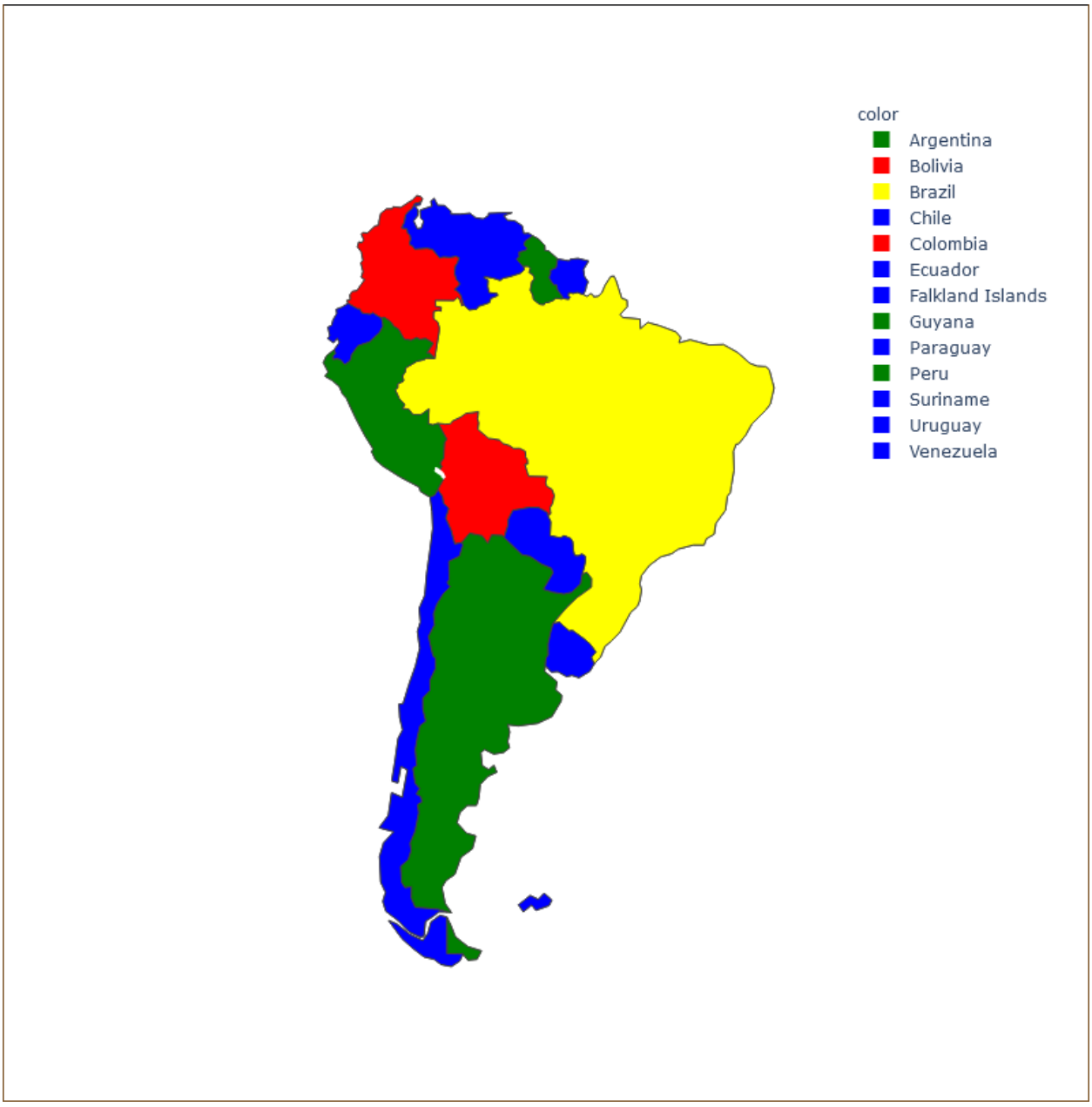
Program tries to assign a color to each node, either randomly or choosing the next available color in the list, and if there is a conflict undoes the step and tries another solution. Keeps doing this until it finds a solution. It is guaranteed to find a solution if it is available.

If it undoes a step, *or backtracks*, it "bans" the last color of the node so it will not assign same color in the second pass. If there is no solution in the current state, it backtracks again, up until it finds a solution.

As there are multiple solutions to this kind of problems, colors chosen randomly in the implementation to see different results. To see a different colored map, simply rerun the program.

Results

Here is an example screenshot of the program's output. It gives a different arrangement of colors for every run.



Contributions

- Provided utility to read from a custom text format representing a disconnected and undirected graph.
- Utility to print a graph as adjacency list.
- Utility to detect self-contained networks in a graph and return these networks separately.
- A `paint_map` function, uses *backtracking search algorithm* to color the regions such that no two regions share the same color. It takes a graph of neighborhood as input and gives a map of name to colors as result.
- Provided tests to check if map is colored correctly.
- `plotly` module is used to visualize the result.