Introduction to Artificial Intelligence Course 67842

Final Project

Project Group

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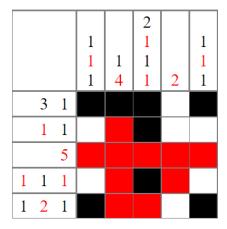Ibraheem Asad – ibasad – 209548205

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- **What problem are you going to solve?**

  The problem we want to solve is Duo Color Nonogram (NP-Complete Problem), in which we want to create an AI agent that can find the optimal solution for the Duo Color Nonogram game (DCN) with the least possible time.

  Nonogram are picture logic puzzles in which cells in a grid must be colored or left blank according to numbers at the side of the grid.

  This is an upgraded version of the Nonogram (Due Color Nonogram), where we have to add another color besides the black -and white-, so for example:

- **How are you going to solve it?**
  We think a good way to solve this problem, by using **Constraint Satisfaction Problems (CSP),** as we will use different heuristics for the backtracking.
  the heuristics s we will try for CSP are MRV, degree heuristic, least constraining value, forward chaining and arc consistency.
  And finally, we will use s BFS, DFS, and A*, to compare the results.

- **Why do you think that your approach is the right one?**
  The board is limited in our game, in particular, the columns and rows are finite, which means we have finite set of cells, that we can describe each cell as a variable, so we have finite number of variables, which corresponds to the definition of the CSP.
  We also have in the margins, numbers which would tell us the color and number of cells we are going to fill, and if we didn't fulfill these rules, then it won't work, which this could be a finite set of constrains as the definition of the CSP says.

Lastly, for each cell, we will have three colors, which means that, there is a function that maps for each cell (variable) a value (colors), as mentioned in the CSP's definition.

- **<u>How are you going to test your results?</u>**
  We will generate different board sizes and compare the running time and the number of backtrack taken to solve problem (for the valid solutions).

  We will compare the results of the heuristics with BFS, DFS and A*, by the number of the expanded nodes of each algorithm.