Activity 1. Branch And Bound

Making use of my corrected version the backtracking, I tried doing the BaB implementation.

I implemented a Node class that has a parent, a heuristic value, and a matrix, to save the state of the board.

The class Node has a method getChildren, that receives a NumbericSquare as a parameter, what it does is, if through the matrix if it finds a -1 (?), in order to find the solutions, it creates a node from 0 to 9 and saves the state of the matrix with it, then it calculates its heuristic value and returns the list of all the children.

The heuristic value of a node is calculated by the number of invalidRows + the number of invalidColumns its matrix (state) has, meaning that a node with value 0 is the node with the correct board state. Finally if it is correct and all the values have been substituted, we’ve found a solution.

In the NumericSquareBaB I did no changes other that the change of name.

In the NumericSquareBaBSolver class I created the BranchAndBound method, it gets Queue of Nodes, having the rootNode on it In the first iteration. Then the method checks wether the queue is not empty, if not it keeps polling nodes, to get their children and adding them to the queue. The stopping condition would be that the Node isSolution(), meaning there are no more -1 and that its heuristicValue is 0.

I get close solutions, but usually a number is wrong, I tried making that if there are no more unknowns but the heuristic!=0 polling other from the queue or going back to the parents until the last one before the heuristic increased, but that is not working.

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| Test | time(ms) |
| Test00 | 11 |
| Test01 | 7 |
| Test02 | 47 |
| Test03 | 191 |
| Test04 | 246 |
| Test05 | 60 |
| Test06 | 184 |
| Test07 | OOT |