Heuristics for A3

Row based model

I used rows as my variables where the domain was a List of List of True or False. True if there was something other than water and False otherwise. My domain had to be all the possible combinations of True, False based on the row constraint and preprocessing.
Number of variables is n for a nxn grid.

Preprocessing

I did quite a bit of preprocessing, eg. When a ‘L’ is seen, mark it True and mark the cell to the right, C, true and all the adjacent cells (to ‘L’ cell and C) false except the one to the right of C. Similar things were done for R, B and T and S. For M only the diagonal cells were marked False. Then after this was done I checked the column constraints and row constraints and marked if necessary eg. row constraint is 0 mark all False. Then for the remaining unknown values I found all the possible combinations of True and False for each row such that the trues add up to the row constraint.

Constraints

I had 2 constraints. One of them was for the ships. I constrained the ships by converting my True or False array to the output board and checking if there was any touching/overlap as well as counting the ships. The other constraints were taken care of, row constraints, the hint ‘M’/’L’/… must be ‘M’/’L’/…’ in the output (I took note of that when creating the domain), and any other constraint was taken care of.

Backtracking with MRV

I then followed the backtracking algorithm from the lecture slides and incorporated MRV heuristic to choose the unassigned value since it was more efficient (used a priority queue). I tried to do GAC with MRV and realized it was less efficient than Backtracking since the domain was already significantly reduced after preprocessing.
I also tried Forward checking with MRV but it also resulted in a slower runtime.
I tried to do a form of caching with my backtracking algorithm but did not result in any changes in runtime (in fact it was slightly slower).