Decision Making - ex 5

Filippo Brajucha, Youssef Hanna

December 2023

1 nQueens

search	Failures	Objective Value
default	16.081.935	810
dWd-rand	18.061.996	732
dWd-rand + restart	12.354.995	672
dWd-rand + restart + LNS	4.183.095	650

2 Analysis

Analyse the results and compare the different search strategies

The first thing that we notice is that all the executions timed out in 5 mins, so we aren't able to find the searched value. We think that is a problem strictly related to the number of the queens to place.
By modifying the solver heuristic and the annotations of the solver, we can observe that the number of the failures decrease as the number of the objective value do. The starting value is 810, with domWdeg-random serach, restart and LNS strategy it becomes 650, so the queens are closer to the diagonal of the scheme.
The situation improves significantly with the Luby restart because, after failing several times, it restarts by exploring a completely different part of the search tree. This way, we can abandon subspaces where errors intensify and explore, diversifying into other parts of the search space. It can be observed that failures decrease as a result.
LNS (Large Neighbourhood Search) is the best solution for reducing the number of failures and achieving the best obj value in the table. Large Neighbourhood Search aims to use a generic and large neighbourhood, exploring it with a complete method like CP. The main idea is to explore a neighbourhood as a solution to a sub-problem. Additionally, it employs a tree search to explore it more quickly and exhaustively. It combines advanced search techniques of CP with the increased scalability obtained from sub-problems. Each time it finds a

solution, it fixes a portion of the variables with the values present in the solution and relaxes the other variables, thus significantly reducing failures.