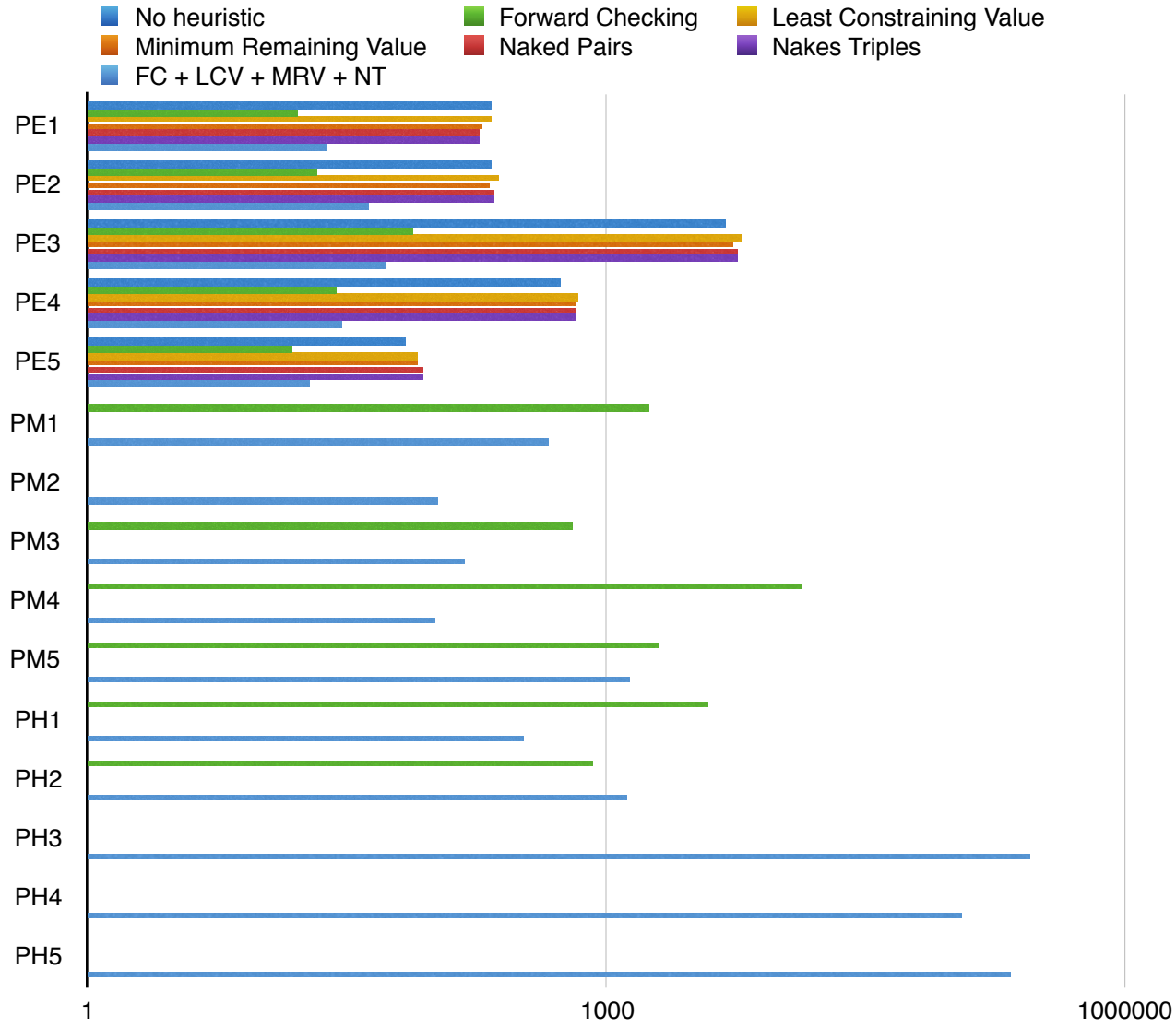
Russell Fenenga 70116153
Harvey Limbo 60695655

CS 171 Sudoku Report

The graph below shows the running time of each combination of algorithms on the first 5 problems from the easy, medium and hard sets. The x axis has a logarithmic scale of running times of the algorithm because it allows us to show all the results in a smaller range of values while still providing the right graphical differences between the algorithms. From this graph we determined that in general the use of Forward Checking, LCV, MRV and Naked Triples provided us with on average the best results. It can be seen that on some problems just forward checking runs faster but on the majority of the problems Forward Checking, LCV, MRV and Naked Triples run faster. This makes sense considering that the algorithms for LCV, MRV and Naked Triples will take time to run so on problems that are generally easier forward checking will perform faster but on problems that are harder the extra heuristics solve it faster. For the graph below you will see that not every combination is present for each problem which means that it failed to find a solution for that problem.



As you can see from our graph about it is clear that on average our Forward Checking, LCV, MRV and Naked Triples algorithm runs the fastest. More proof of this can be seen when looking at the statistics of running time/backtracks for each of the different algorithms:

No Heuristics: 33$ Success Rate
PE1.txt : 0.13
PE2.txt : 0.13
PE3.txt : 0.02
PE4.txt : 0.03
PE5.txt : 0.13
The rest fail

Forward Checking: 78% Success Rate
PE1.txt : 2.7
PE2.txt : 2.625
PE3.txt : 0.58
PE4.txt : 2.07
PE5.txt : 2.5

PM1.txt : 0.308
PM2.txt : Failed to find solution
PM3.txt : 0.46
PM4.txt : 0.36
PM5.txt : 0.37

PH1.txt : 0.38
PH2.txt : 0.77
PH3.txt : Failed to Find Solution
PH4.txt : Failed to Find Solution
PH5.txt : Failed to Find Solution

LCV: 33% Success Rate
PE1.txt : 0.13
PE2.txt : 0.13
PE3.txt : 0.02
PE4.txt : 0.03
PE5.txt : 0.13
The rest fail

MRV: 33% Success Rate
PE1.txt : 0.13
PE2.txt : 0.13
PE3.txt : 0.02
PE4.txt : 0.03
PE5.txt : 0.13
The rest fail

Naked Pairs: 33% Success Rate
PE1.txt : 0.13
PE2.txt : 0.13
PE3.txt : 0.02
PE4.txt : 0.03
PE5.txt : 0.13
The rest fail

Forward Checking, LCV, MRV, Naked Triples 100% Success Rate

PE1.txt : 24.0
PE2.txt : 1.82
PE3.txt : 1.53
PE4.txt : 9.7
PE5.txt : 19.0

PM1.txt : 0.84
PM2.txt : 6.9
PM3.txt : 2.5
PM4.txt : 102
PM5.txt : 0.55

PH1.txt : 334
PH2.txt : 1.18
PH3.txt : 1.06
PH4.txt : 1.02
PH5.txt : 1.04

These values show that overall the amount of backtracks is on average lower than the total running time of the algorithm. Comparing these values with the values in the graph above it is evident that the Forward Checking, LCV, MRV, Naked Triples algorithm provides the best results for us.