

Experience: Assignment 3, AI Solver

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In the Experience for Assignment 3 AI Solver, based on the tables about the number of pegs left, generated nodes, expanded nodes, expanded/second, and total execution time for each layout (Table1- Table10 on page2) in different budgets, it is quite clear that while the layout has a lower number of pegs initially in the board, after running the AI Solver, it would have higher chance to have a lower number of pegs left or even win the game. For example, in layout 0 which has only 3 pegs initially, the AI Solver could win the game in any budget.

On the other hand, in layout 6 which has 44 pegs initially, the AI Solver could not win the game even using the highest budget 1.5M as required and still has 3-5 pegs left on the board at the end of the game. The first figure further supports this statement.

On the plot, all the layout provided which has less than 35 pegs could be won by the AI Solve using any budget. However, for the layout which has greater than 35 pegs initially, the finally pegs left are always greater than 0, whatever using which budget value. **Therefore, for the layout provided, while the initially pegs of the board increase, the number of pegs left has a trend to increase after running the AI Solver.**

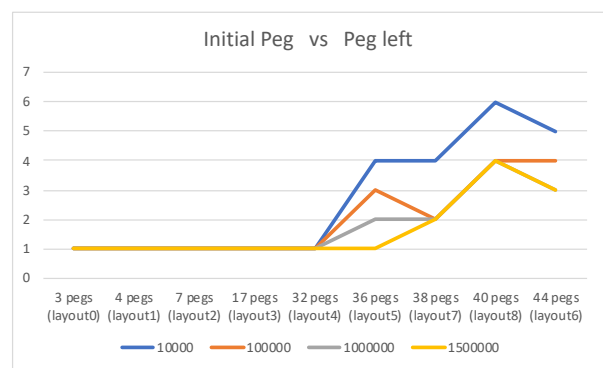


Figure1.

Moreover, the value of the budget chooses also has an effect on the solution quality(number of peg left) as well. In figure 2, the plot shows how the number of pegs left change while increase the budget value from 10k to 1.5M for the last 4 layouts.

This plot shows that for each layout, while the budget value increases the number of peg left has a trend to decrease. For example, for the blue line which is the line representing the layout5, when the budget only has 10k, the peg left after running the AI Solver is 4.

Increasing the budget to 100k, the number of pegs left decreases to 3, increasing the budget to 1M, the number of pegs left decreases to 2. In the end, while using the budget

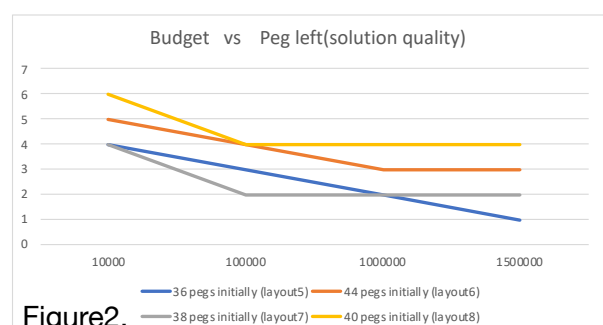


Figure2.

of 1.5M, the AI Solver could win the game and only 1 peg left. Although it seems that the other 3 layouts do not have such an obvious reduction of the pegs left, all layouts in this plot have shown **there is a trend of the number of pegs left to reduce(decrease) while increasing the budget.**

To further support or emphasis this statement, the following experience could apply higher budget value for the last four layouts, such as 3M, 5M, or even more budget, like figure3 shown.

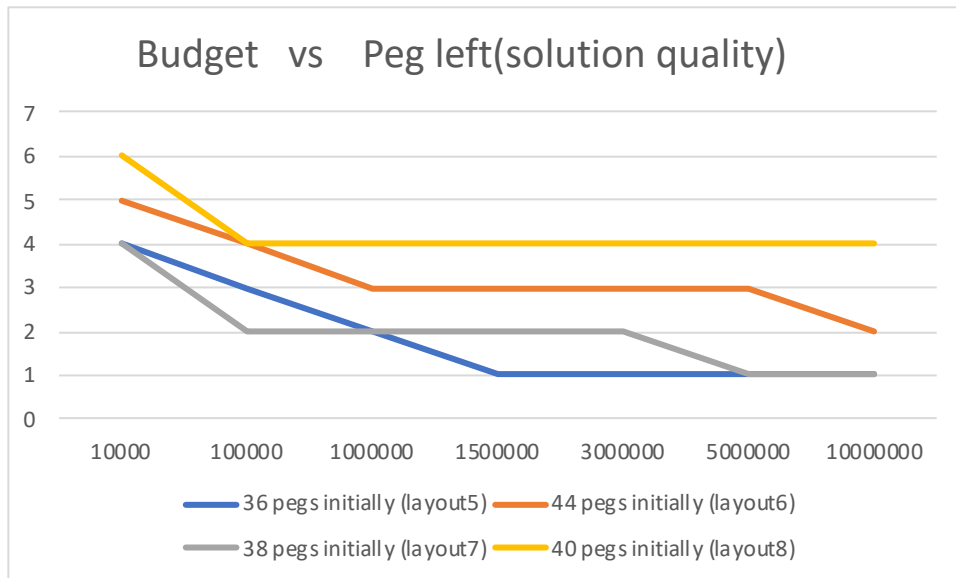


Figure3.

| layout 0 (3 pegs initially) | | | | | | |
|-----------------------------|------|---------------------|-----------------|----------------|-----------------|----------------------|
| Budget | Data | Number of pegs left | Generated nodes | Expanded nodes | Expanded/second | Total execution time |
| 10k | | 1 | 2 | 2 | 15 | 0.131558 |
| 100k | | 1 | 2 | 2 | 16 | 0.124768 |
| 1M | | 1 | 2 | 2 | 15 | 0.127361 |
| 1.5M | | 1 | 2 | 2 | 15 | 0.131255 |

Table1.

| layout 1 (4 pegs initially) | | | | | | |
|-----------------------------|------|---------------------|-----------------|----------------|-----------------|----------------------|
| Budget | Data | Number of pegs left | Generated nodes | Expanded nodes | Expanded/second | Total execution time |
| 10k | | 1 | 3 | 3 | 20 | 0.143415 |
| 100k | | 1 | 3 | 3 | 22 | 0.133962 |
| 1M | | 1 | 3 | 3 | 23 | 0.130317 |
| 1.5M | | 1 | 3 | 3 | 23 | 0.129599 |

Table2.

| layout 2 (7 pegs initially) | | | | | | |
|-----------------------------|------|---------------------|-----------------|----------------|-----------------|----------------------|
| Budget | Data | Number of pegs left | Generated nodes | Expanded nodes | Expanded/second | Total execution time |
| 10k | | 1 | 8 | 7 | 51 | 0.1349 |
| 100k | | 1 | 8 | 7 | 52 | 0.133863 |
| 1M | | 1 | 8 | 7 | 53 | 0.130282 |
| 1.5M | | 1 | 8 | 7 | 52 | 0.1326 |

Table3.

| layout 3 (17 pegs initially) | | | | | | |
|------------------------------|------|---------------------|-----------------|----------------|-----------------|----------------------|
| Budget | Data | Number of pegs left | Generated nodes | Expanded nodes | Expanded/second | Total execution time |
| 10k | | 1 | 10282 | 3541 | 25073 | 0.141224 |
| 100k | | 1 | 10282 | 3541 | 25495 | 0.138887 |
| 1M | | 1 | 10282 | 3541 | 25229 | 0.140353 |
| 1.5M | | 1 | 10282 | 3541 | 24922 | 0.142083 |

Table4.

| layout 4 (32 pegs initially) | | | | | | |
|------------------------------|---------------------|-----------------|----------------|-----------------|----------------------|--|
| Budget \ Data | Number of pegs left | Generated nodes | Expanded nodes | Expanded/second | Total execution time | |
| 10k | 1 | 2418 | 1065 | 8144 | 0.130757 | |
| 100k | 1 | 2418 | 1065 | 8178 | 0.130219 | |
| 1M | 1 | 2418 | 1065 | 7940 | 0.13413 | |
| 1.5M | 1 | 2418 | 1065 | 8004 | 0.13305 | |

Table5.

| layout 5 (36 pegs initially) | | | | | | |
|------------------------------|---------------------|-----------------|----------------|-----------------|----------------------|--|
| Budget \ Data | Number of pegs left | Generated nodes | Expanded nodes | Expanded/second | Total execution time | |
| 10k | 4 | 26495 | 10000 | 61397 | 0.162873 | |
| 100k | 3 | 359818 | 100000 | 180287 | 0.554671 | |
| 1M | 2 | 4488464 | 1000000 | 199053 | 5.2378 | |
| 1.5M | 1 | 4898609 | 1090275 | 196685 | 5.543237 | |

Table6.

| layout 6 (44 pegs initially) | | | | | | |
|------------------------------|---------------------|-----------------|----------------|-----------------|----------------------|--|
| Budget \ Data | Number of pegs left | Generated nodes | Expanded nodes | Expanded/second | Total execution time | |
| 10k | 5 | 29368 | 10000 | 61160 | 0.163503 | |
| 100k | 4 | 374378 | 100000 | 175182 | 0.570833 | |
| 1M | 3 | 4481233 | 1000000 | 199527 | 5.011844 | |
| 1.5M | 3 | 7020668 | 1500000 | 179687 | 8.347831 | |

Table7.

| layout 7 (38 pegs initially) | | | | | | |
|------------------------------|---------------------|-----------------|----------------|-----------------|----------------------|--|
| Budget \ Data | Number of pegs left | Generated nodes | Expanded nodes | Expanded/second | Total execution time | |
| 10k | 4 | 32469 | 10000 | 60156 | 0.166234 | |
| 100k | 2 | 386440 | 100000 | 146048 | 0.684705 | |
| 1M | 2 | 4790308 | 1000000 | 169405 | 5.902982 | |
| 1.5M | 2 | 7173504 | 1500000 | 190188 | 7.886924 | |

Table8.

| layout 8 (40 pegs initially) | | | | | | |
|------------------------------|---------------------|-----------------|----------------|-----------------|----------------------|--|
| Budget \ Data | Number of pegs left | Generated nodes | Expanded nodes | Expanded/second | Total execution time | |
| 10k | 6 | 27562 | 10000 | 58885 | 0.169822 | |
| 100k | 4 | 349921 | 100000 | 154897 | 0.64559 | |
| 1M | 4 | 4073028 | 1000000 | 206456 | 4.843636 | |
| 1.5M | 4 | 6361454 | 1500000 | 176548 | 8.49626 | |

Table9.