**Report:** N-Queens and Puzzle

**N-Queens**

In the following two tables we summarize the results for each run of the model with **n** as the size in the grid (that is defined as a grid **nn**). We can observe how, as **n** increase, both the **solutions found** and the **number of failed tries,** increases.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| v | #sols | r | rc1 | rc2 | rc3 | aldiff |
| 8 | 92 | 891 | 500 | 593 | 864 | 254 |
| 9 | 352 | 4,262 | 2,656 | 2,771 | 4,458 | 849 |
| 10 | 724 | 23,291 | 14,003 | 13,585 | 23,201 | 3,722 |
| 12 | 14,200 | 773,550 | 353,151 | 380,556 | 820,087 | 75,823 |

**Q: What happens when changing model from rrc1alldiff?**

A: Starting with the **Row Model** it is the one with the biggest domain of available solutions since it has **only 2 constraints**:

1. The one to prevent row attacks.
2. The one to prevent diagonal attacks.

This means that the model has many possible routes to follow on the solutions tree but only few of them are correct. In fact, this is one of the models with the biggest number of failed tries.

Using the **rc1** model grants us more constraint and a reduces domain in which to search for the solutions, being the more “optimized” version of the **RC Models**, in terms of constraints given to decrease the size of the domain of solutions**.**

Finally, the **alldiff** model is the best one compared to all the others. Probably because all the constraints are **global constraints** and dramatically decrease the size of the search domain.

**Q: What happens when changing model from rc1rc2rc3?**

A: We can observe, as partially said before, that the removal of constraints expands the search domain and it shows on the increase in the number of failed attempts to find the solution (only in one case, from **rc1 to rc2**, with n=10 there’s a small decrease in the number of failed attempts).

The same happens when we remove another constraint and go from **rc2 to rc3**.

|  |  |  |
| --- | --- | --- |
| N | #sols | aldiffsym |
| 8 | 12 | 75 |
| 9 | 46 | 246 |
| 10 | 92 | 871 |
| 12 | 1,787 | 16,935 |

**Q: What happens when changing model from alldiffalldiffsym**

A: The **alldiffsym** model is broadly the best in term of failed attempts, that’s thanks to the removal of symmetric routes from the search domain and to the global constraints inherited from the **alldiff** model. It also has way less solutions for the same reason: we are removing the symmetric solutions also, not only the symmetric failing routes.

**Puzzle**

|  |  |  |
| --- | --- | --- |
| N | Base | Base + Implied |
|  | Fails Time | Fails Time |
| 500 | 618 34.817s | 495 28.131s |
| 1000 |  | 995 1m 37s |