So, I ended up resubmitting this late because my C++ solution was Not Good™ and I couldn’t find the issue. My new solution in python is certainly an improvement, but my UCH is not perfect. I left my C++ solution in case that is wanted, but the python solution DPLL.py is what I am submitting and what my results are from. I still don’t know what I did differently in terms of logic in python, but it’s like that sometimes I guess.

What I found interesting was that in some cases the UCH does indeed perform better than without, but in other cases it breaks entirely and runs an infinite loop, or just performs worse. Normal DPLL performs quite well in all cases, and I am glad I decided to redo the entire code (again) this time in Python, because it is much better. Either way, I am well beyond burnt out on this assignment.

**Map Coloring with no heuristic function**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **./DPLL mapcolor.cnf** | **./DPLL mapcolor.cnf QG** | **./DPLL mapcolor.cnf QG VB** |
| **DPLL Calls** | 36 | 103 | 135 |
| **Final Model** | Satisfied (true) propositions:  WAR NTG QR NSWG VR SAB TR | Satisfied (true) propositions:  WAG NTR QG NSWR VG SAB TR | Problem is unsatisfiable |

**Map coloring with Heuristic function**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **./DPLL mapcolor.cnf +UCH** | **./DPLL mapcolor.cnf QR +UCH** | **./DPLL mapcolor.cnf QG VB +UCH** |
| **DPLL Calls** | 22 | 4603 | Does not finish |
| **Final Model** | WAR NTG QR NSWG VR SAB TR | WAG NTR QG NSWR VG SAB TR | Does not finish |

|  |  |  |
| --- | --- | --- |
|  | **./DPLL sammy.cnf O1Y O2W O3Y L1W L2Y L3B** | **./DPLL sammy.cnf O1W O2Y O3W L1W L2B L3B** |
| **DPLL Calls** | 68 | 46 |
| **Final Model** | 68  C1B C2W C3Y L1Y L1W L2Y L2B L3W L3B O1Y O1W O2W O3Y | C1B C2Y C3W L1Y L1W L2W L2B L3Y L3B O1Y O1W O2Y O3W |

**Sammy’s Sport Shop with no heuristic**

**Sammy’s Sport Shop with heuristic**

|  |  |  |
| --- | --- | --- |
|  | **./DPLL sammy.cnf O1Y O2W O3Y L1W L2Y L3B** | **./DPLL sammy.cnf O1W O2Y O3W L1W L2B L3B** |
| **DPLL Calls** | 15 | 15 |
| **Final Model** | C1B C2W C3Y L1W L2Y L3B O1Y O2W O3Y | C1B C2Y C3W L1W L2B L3B O1W O2Y O3W |

**3 Queens**

|  |  |  |
| --- | --- | --- |
|  | **./DPLL 3\_queens.cnf** | **./DPLL 3\_queens.cnf +UCH** |
| **DPLL Calls** | 43 | 1142 |
| **Final Model** | Problem is unsatisfiable | Problem is unsatisfiable |

**4 Queens**

|  |  |  |
| --- | --- | --- |
|  | **./DPLL 4\_queens.cnf** | **./DPLL 4\_queens.cnf +UCH** |
| **DPLL Calls** | 71 | Does not finish |
| **Final Model** | Q12 Q24 Q31 Q43 | Does not finish |

**5 Queens**

|  |  |  |
| --- | --- | --- |
|  | **./DPLL 5\_queens.cnf** | **./DPLL 5\_queens.cnf +UCH** |
| **DPLL Calls** | 46 | 26 |
| **Final Model** | Q11 Q23 Q35 Q42 Q54 | Q11 Q23 Q35 Q42 Q54 |

**6 Queens**

|  |  |  |
| --- | --- | --- |
|  | **./DPLL 6\_queens.cnf** | **./DPLL 6\_queens.cnf +UCH** |
| **DPLL Calls** | 483 | Does not finish |
| **Final Model** | Q12 Q24 Q36 Q41 Q53 Q65 | Does not finish |