**Programming Assignment 2: More Challenging Answer Set Programming**

Q1

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| Input  Program | Hint: you only need one program with a new term, whose value will be assigned to 3 or 4 in the command line.  :- not {on(BB,table,T)} tablee\_size, T=0..m-1. |
| Command  Line | You should write multiple command lines below.  Clingo 1.lp scenario-1.lp -c m=6 -c grippers=1 -c tab\_size=3 0  Clingo 1.lp scenario-1.lp -c m=7 -c grippers=1 -c tab\_size=3 0  Clingo 1.lp scenario-1.lp -c m=4 -c grippers=1 -c tab\_size=4 0  Clingo 1.lp scenario-1.lp -c m=5 -c grippers=1 -c tab\_size=4 0 |
| Output  of clingo | You should write multiple outputs, one for each command. These outputs serve as the evidences of your answer to the question below.  Tab\_size=3, m=6:    Tab\_size=3, m=7:    Tab\_size=4, m=4:    Tab\_size=4, m=5: |
| Answer  to Questions | Fill in the following table that lists the number of steps to solve the modified block world problem for different value of n, where n is the maximal number of blocks that can be placed directly on the table.   |  |  | | --- | --- | | n | Number of steps | | 3 | 5 | | 4 | 7 | |

Q2

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| Input  Program | Hint: you don’t need to represent any scenario since you want to find out all possible valid states. Also think about the value of m.  :- on(BLCK1, BLCK2, T), on(BLCK2, BLCK1, T).  :- on(BLCK1, BLCK2, T), on(BLCK2, BLCKe3, T), on(BLCKe3, BLCK1, T).  :- on(BLCK1, BLCK2, T), on(BLCK2, BLCKe3, T), on(BLCKe3, BLCK4, T), on(BLCK4, BLCK1, T).  :- on(BLCK1, BLCK2, T), on(BLCK2, BLCKe3, T), on(BLCKe3, BLCK4, T), on(BLCK4, BLCK5, T), on(BLCK5, BLCK1, T).  :- on(BLCK1, BLCK2, T), on(BLCK2, BLCKe3, T), on(BLCKe3, BLCK4, T), on(BLCK4, BLCK5, T), on(BLCK5, BLCK6, T), on(BLCK6, BLCK1, T).  %:- not #count{ B : on(B, BB, T), BB != table} = N-P , P = #count{ B: on(B, table, T) }, N = #count{ B: block(B) }.  block(1..6). |
| Command  Line | Clingo 2.lp -c m=0 -c grippers=2 0 |
| Output  of clingo |  |
| Answer  to Questions | How many valid states are there when there are 6 blocks? (Note that the limitation of blocks introduced in question 1 is not considered here.)  M=0  4051 Models |

Q3

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| Input  Program | Hint: the number of grippers is unlimited, meaning that you can have as many movements as you want as far as the movements are serializable.  :- move(B, L, T), move(B1, L1, T), L != table, on(B1, L, T), B != B1. |
| Command  Line | Please only show the command line that outputs the minimal length plan.  Clingo 3.lp scenario-3.lp -c x=8 -c grippers=10000 |
| Output  of clingo | X=8: |

Q4

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| Input  Program | % optimize  #minimize{1, B, L, T : move(B, L, T)}. |
| Command  Line | You should write multiple command lines below.  Clingo 4.lp scenario-4.lp -c x=8 -c grippers=10000 -t4  Clingo 4.lp scenario-4.lp -c x=9 -c grippers=10000  Clingo 4.lp scenario-4.lp -c x=10 -c grippers=10000 -t4 |
| Output  of clingo | You should write multiple outputs, one for each command. These outputs serve as the evidences of your answer to the question below.  X=8:    X=9:    X=10: |
| Answer  to Questions | What is the least number of actions when maxstep m is 8, 9, and 10?   |  |  | | --- | --- | | m | least number of actions | | 8 | 18 | | 9 | 16 | | 10 | 15 | |