AI – HW1 dry

Part A:

1. Permutation table for legal paths when , and with and without gas stations:

|  |  |  |
| --- | --- | --- |
| K= | without gas stations | with gas stations l=5 |
| 1 | 1 | 1 |
| 2 | 2 | 10 |
| 3 | 6 | 150 |
| 4 | 24 | 3000 |
| 5 | 120 | 75000 |
| 6 | 720 | 2250000 |
| 7 | 5040 | 78750000 |
| 8 | 40320 | 3150000000 |
| 9 | 362880 | 1.4175E+11 |
| 10 | 3628800 | 7.0875E+12 |

1. The max and min values of the branching factor is as follow:
   1. The min value is 0. Explanation: in case we move from order *v* to order *u* when

and we still got orders to deliver, we are stuck at order *u* and cannot continue. Formally:

* 1. The max value is . Explanation: in case that the fuel tank is sufficient to get from to every order/gas station.

Formally: ,

1. Yes, we can have cycle in that graph. Let us assume that are gas stations,

And that when .

then we can move to and move back to

Notice that T and F stay the same.

1. The size of the span is as follow:

Explanation: each state is a vector of 4 parameters. We got destinations (vertices), in each destination we got fuel=d when , and the group of Orders we already delivered is , plus the start position .

There are number of unreachable configurations – for example: when

Second example when and .

1. Yes for example we can reach when

It means that we delivered an order and then ran out of gas.

1. Definition of the function:
2. The lower bound for getting to any target configuration is , because in each step we can deliver just 1 order (visit just 1 vertex), in each step we can sub from T and add to F just 1 order. Since at the start the and in any target configuration, we will need at least steps to get to the target (=search depth of