

AI Assignment 2

Team 37
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Q1) Part B

a) Discount Factor = 0.1

-- E -

N W E N

N N - N

N W - E

Owing to very low discount factor, i.e. high discounting, utility does not propagate very far. Therefore despite having the ability to reach a higher goal state, it chooses to reach one that is close(eg : At (1,0), (1,1)).

Rest of the behavior is as per what would be expected “rationally” based on step cost.

b) Discount Factor = 0.99

-- E -

E E E N

E N - N

N N - N

Policy prescribes going to highest goal state(0,3) as it more than compensates the step cost.

c) DF =0.99, Step Cost = 37

-- W -

S E W S
 E N - N
 N W - E

Owing to step cost being positive, the policy prefers not leaving the board at all, i.e. actively avoids end states. Eg:- S in (1,0), W(despite having a wall) in (0,2), S in (1,3), E in (3,3). In all these examples it has picked the option where there is no chance of it making to the exit stage.

d) DF = 0.99, Step cost = -7.4

- - E -
 E E E N
 N N - N
 N N - N

Actively tries to get best goal state. Similar to b), except it slightly prefers the smaller positive goal state more at (2,0), i.e. slight preference to leave board faster owing to higher penalty.

e) DF =0.99, Step = -9.25

- - E -
 N E E N
 N N - N
 N E - N

Tries at actively leave the board very fast as the penalty is high, so it doesn't mind taking even the negative goal state if it means being able to leave the board faster as in the case of (3,1). If better alternative state near enough to compensate for step cost, it prefers that state(eg 3,3).

f) DF = 0.99, Step = -37

-- E -
 N W E N
 N S - N
 E E - W

Very high negative step cost makes policy dictate to the nearest exit, as even the best state cannot compensate for the step cost if more than one step is needed. Eg:- (2,1) is closer to the negative goal state than the positive goal states, so it actively tries to go towards it.

Entire Process :

a)

0 -----

3.700	None	0.000	37.000
0.000	0.000	0.000	0.000
0.000	0.000	None	0.000
0.000	0.000	-7.400	0.000

1 -----

3.700	None	-0.740	37.000
-3.404	-3.700	-3.700	-0.740
-3.700	-3.700	None	-3.700
-3.700	-3.700	-7.400	-3.700

2 -----

3.700	None	-0.784	37.000
-3.475	-4.046	-3.804	-0.784

-4.046	-4.070	None	-3.833
-4.070	-4.070	-7.400	-4.070

3 -----

3.700	None	-0.786	37.000
-3.479	-4.059	-3.809	-0.786
-4.059	-4.105	None	-3.839
-4.105	-4.107	-7.400	-4.105

Final Policy

-- E -
 N W E N
 N N - N
 N W - E

b)

0 -----

3.700	None	0.000	37.000
0.000	0.000	0.000	0.000
0.000	0.000	None	0.000
0.000	0.000	-7.400	0.000

1 -----

3.700	None	25.604	37.000
-0.770	-3.700	-3.700	25.604
-3.700	-3.700	None	-3.700
-3.700	-3.700	-7.400	-3.700

2 -----

3.700	None	27.772	37.000
-1.212	-5.042	18.747	27.772
-5.042	-7.363	None	15.846

-7.363 -7.363 -7.400 -7.363

3 -----

3.700	None	30.209	37.000
-1.389	9.919	22.901	30.209
-5.888	-8.921	None	21.433
-9.151	-10.989	-7.400	7.388

4 -----

3.700	None	30.862	37.000
3.940	14.537	25.484	30.862
-6.266	2.690	None	24.470
-10.357	-11.532	-7.400	13.274

5 -----

3.700	None	31.182	37.000
7.559	18.189	26.321	31.182
-0.934	7.459	None	25.588
-10.830	-3.327	-7.400	16.261

6 -----

3.700	None	31.297	37.000
10.979	19.685	26.689	31.297
2.933	11.351	None	26.063
-5.841	0.403	-7.400	17.443

7 -----

3.700	None	31.345	37.000
12.547	20.510	26.828	31.345
6.410	13.305	None	26.247
-1.916	3.979	-7.400	17.936

8 -----

3.700	None	31.363	37.000
13.545	20.895	26.884	31.363
8.189	14.496	None	26.322
1.581	5.915	-7.400	18.131

9 -----

3.700	None	31.370	37.000
14.026	21.096	26.906	31.370
9.278	15.095	None	26.351
3.528	7.205	-7.400	18.209

10 -----

3.700	None	31.373	37.000
14.293	21.192	26.915	31.373
9.993	15.421	None	26.363
4.711	7.872	-7.400	18.240

11 -----

3.700	None	31.375	37.000
14.440	21.241	26.918	31.375
10.395	15.600	None	26.368
5.460	8.247	-7.400	18.253

12 -----

3.700	None	31.375	37.000
14.518	21.267	26.920	31.375
10.626	15.697	None	26.369
5.890	8.463	-7.400	18.258

13 -----

3.700	None	31.375	37.000
14.561	21.280	26.920	31.375
10.752	15.749	None	26.370

6.136 8.582 -7.400 18.259

14 -----

3.700 None 31.375 37.000
14.584 21.287 26.920 31.375
10.822 15.777 None 26.370
6.273 8.648 -7.400 18.260

15 -----

3.700 None 31.375 37.000
14.597 21.290 26.920 31.375
10.860 15.792 None 26.371
6.348 8.684 -7.400 18.261

16 -----

3.700 None 31.375 37.000
14.603 21.292 26.920 31.375
10.881 15.800 None 26.371
6.390 8.703 -7.400 18.261

Final Policy

-- E -

E E E N

E N - N

N N - N

c)

d)

0 -----

3.700	None	0.000	37.000
0.000	0.000	0.000	0.000
0.000	0.000	None	0.000
0.000	0.000	-7.400	0.000

1 -----

3.700	None	21.904	37.000
-4.470	-7.400	-7.400	21.904
-7.400	-7.400	None	-7.400
-7.400	-7.400	-7.400	-7.400

2 -----

3.700	None	23.340	37.000
-5.645	-12.405	11.384	23.340
-12.405	-14.726	None	8.483
-14.726	-14.726	-7.400	-14.726

3 -----

3.700	None	25.342	37.000
-6.257	-1.070	14.523	25.342
-14.557	-19.911	None	12.765
-20.141	-16.177	-7.400	-2.872

4 -----

3.700	None	25.851	37.000
-5.195	2.025	16.617	25.851
-15.767	-11.660	None	15.198
-22.524	-16.833	-7.400	1.693

5 -----

3.700	None	26.108	37.000
-4.783	4.807	17.278	26.108

-14.230	-8.511	None	16.083
-23.784	-16.082	-7.400	4.072

6 -----

3.700	None	26.199	37.000
-4.467	5.917	17.573	26.199
-13.440	-5.844	None	16.462
-22.617	-15.696	-7.400	5.008

7 -----

3.700	None	26.237	37.000
-3.678	6.525	17.683	26.237
-12.847	-4.623	None	16.609
-21.837	-15.000	-7.400	5.401

8 -----

3.700	None	26.252	37.000
-3.138	6.793	17.728	26.252
-12.042	-3.962	None	16.669
-21.222	-13.956	-7.400	5.557

9 -----

3.700	None	26.258	37.000
-2.845	6.921	17.746	26.258
-11.469	-3.604	None	16.692
-20.420	-13.371	-7.400	5.619

10 -----

3.700	None	26.260	37.000
-2.688	6.983	17.753	26.260
-11.146	-3.411	None	16.701
-19.829	-13.008	-7.400	5.644

11 -----

3.700	None	26.261	37.000
-2.607	7.014	17.756	26.261
-10.970	-3.311	None	16.705
-19.478	-12.797	-7.400	5.654

12 -----

3.700	None	26.262	37.000
-2.565	7.029	17.757	26.262
-10.878	-3.259	None	16.707
-19.283	-12.683	-7.400	5.658

13 -----

3.700	None	26.262	37.000
-2.544	7.036	17.757	26.262
-10.831	-3.233	None	16.707
-19.180	-12.623	-7.400	5.659

Final Policy

-- E -
E E E N
N N - N
N N - N

e)

0 -----

3.700	None	0.000	37.000
0.000	0.000	0.000	0.000
0.000	0.000	None	0.000
0.000	0.000	-7.400	0.000

1 -----

3.700	None	20.054	37.000
-6.320	-9.250	-9.250	20.054
-9.250	-9.250	None	-9.250
-9.250	-9.250	-7.400	-9.250

2 -----

3.700	None	21.124	37.000
-7.861	-16.087	7.702	21.124
-16.087	-18.408	None	4.801
-18.408	-16.942	-7.400	-16.942

3 -----

3.700	None	22.908	37.000
-8.690	-6.565	10.334	22.908
-18.891	-25.260	None	8.431
-25.490	-18.610	-7.400	-7.857

4 -----

3.700	None	23.345	37.000
-7.830	-4.216	12.184	23.345
-20.504	-18.820	None	10.562
-28.383	-19.454	-7.400	-4.083

5 -----

3.700	None	23.571	37.000
-7.512	-1.881	12.757	23.571
-19.344	-16.482	None	11.330
-29.497	-18.900	-7.400	-2.022

6 -----

3.700	None	23.650	37.000
-7.250	-0.965	13.015	23.650
-18.747	-14.287	None	11.662

-29.054 -18.614 -7.400 -1.209

7 -----

3.700 None 23.684 37.000
-7.133 -0.452 13.111 23.684
-18.262 -13.284 None 11.790
-28.724 -18.368 -7.400 -0.866

8 -----

3.700 None 23.697 37.000
-7.071 -0.226 13.150 23.697
-18.022 -12.731 None 11.842
-28.376 -18.244 -7.400 -0.730

9 -----

3.700 None 23.702 37.000
-7.042 -0.118 13.166 23.702
-17.894 -12.474 None 11.863
-28.139 -18.177 -7.400 -0.676

10 -----

3.700 None 23.704 37.000
-7.028 -0.069 13.172 23.704
-17.834 -12.350 None 11.871
-28.008 -18.145 -7.400 -0.654

11 -----

3.700 None 23.705 37.000
-7.022 -0.047 13.174 23.705
-17.805 -12.293 None 11.874
-27.943 -18.130 -7.400 -0.646

12 -----

3.700	None	23.705	37.000
-7.020	-0.038	13.175	23.705
-17.791	-12.267	None	11.875
-27.913	-18.123	-7.400	-0.642

13 -----

3.700	None	23.705	37.000
-7.018	-0.034	13.175	23.705
-17.785	-12.256	None	11.876
-27.898	-18.119	-7.400	-0.641

14 -----

3.700	None	23.705	37.000
-7.018	-0.032	13.176	23.705
-17.783	-12.251	None	11.876
-27.892	-18.118	-7.400	-0.641

15 -----

3.700	None	23.705	37.000
-7.017	-0.031	13.176	23.705
-17.781	-12.248	None	11.876
-27.889	-18.117	-7.400	-0.640

16 -----

3.700	None	23.705	37.000
-7.017	-0.030	13.176	23.705
-17.781	-12.247	None	11.876
-27.887	-18.117	-7.400	-0.640

17 -----

3.700	None	23.705	37.000
-7.017	-0.030	13.176	23.705
-17.781	-12.247	None	11.876

-27.887 -18.117 -7.400 -0.640

Final Policy

-- E -

N E E N

N N - N

N E - N

f)

0 -----

3.700 None 0.000 37.000

0.000 0.000 0.000 0.000

0.000 0.000 None 0.000

0.000 0.000 -7.400 0.000

1 -----

3.700 None -7.696 37.000

-34.070 -37.000 -37.000 -7.696

-37.000 -37.000 None -37.000

-37.000 -37.000 -7.400 -37.000

2 -----

3.700 None -12.121 37.000

-41.105 -71.309 -47.520 -12.121

-71.309 -73.630 None -50.421

-73.630 -50.187 -7.400 -50.187

3 -----

3.700 None -13.600 37.000

-45.199 -83.905 -52.504 -13.600

-83.905 -91.097 None -56.583

-91.097 -55.119 -7.400 -52.821

4 -----

3.700	None	-14.240	37.000
-46.851	-90.122	-54.316	-14.240
-90.122	-97.979	None	-58.975
-97.979	-57.336	-7.400	-53.692

5 -----

3.700	None	-14.483	37.000
-47.630	-92.728	-55.065	-14.483
-92.728	-101.032	None	-59.955
-101.032	-58.237	-7.400	-54.015

6 -----

3.700	None	-14.581	37.000
-47.965	-93.905	-55.356	-14.581
-93.905	-102.306	None	-60.342
-102.306	-58.628	-7.400	-54.144

7 -----

3.700	None	-14.620	37.000
-48.115	-94.413	-55.472	-14.620
-94.413	-102.859	None	-60.496
-102.859	-58.793	-7.400	-54.195

Final Policy

-- E -

N W E N

N S - N

E E - W

